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Mechanic's Guide

BY J. N. MAYO

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JUL 17 1915
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INTRODUCTION.

This book contains private recipes and formulas not known to the average workman. It contains some of the best secrets known to mechanical skill. The ambitious workman is always in search of knowledge—in search of new ideas. Any person wishing to thoroughly master any art must be to a certain extent capable of self instruction. The repair man is often called on to do all kinds of odd jobs, especially in country towns. It would be next to impossible for the workman to remember all the various things he has read or heard about. The author believes that such persons will welcome this volume, and that it will prove valuable for all mechanics. I have put in twenty-five years of my life doing such work as this book contains.

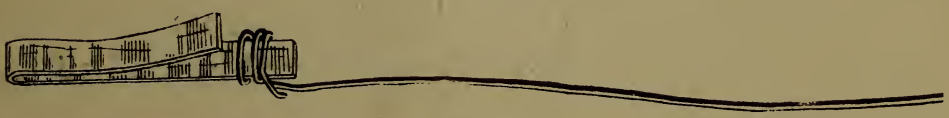
There is one great mistake that many mechanics make, by commencing a job of work that they don't understand. They will commence work on a difficult job and try to

figure out how they will accomplish it at the same time they are doing the work. The proper thing for a mechanic to do when he is called to do a job of work that he does not thoroughly understand, is to take a seat and sit still for 5 or 10 minutes and study out the best way to do the job before he commences. Any mechanic that practices this rule will find the way to success about 9 times out of 10.

TEMPERING SPRINGS.

The first thing I will call your attention to, is the art of making springs. Springs have been used for hundreds of years. This book applies to light springs only. The secret of making springs is the tempering part. To temper springs proceed as follows:

Use an earthen crock or pan that will hold about a gallon;



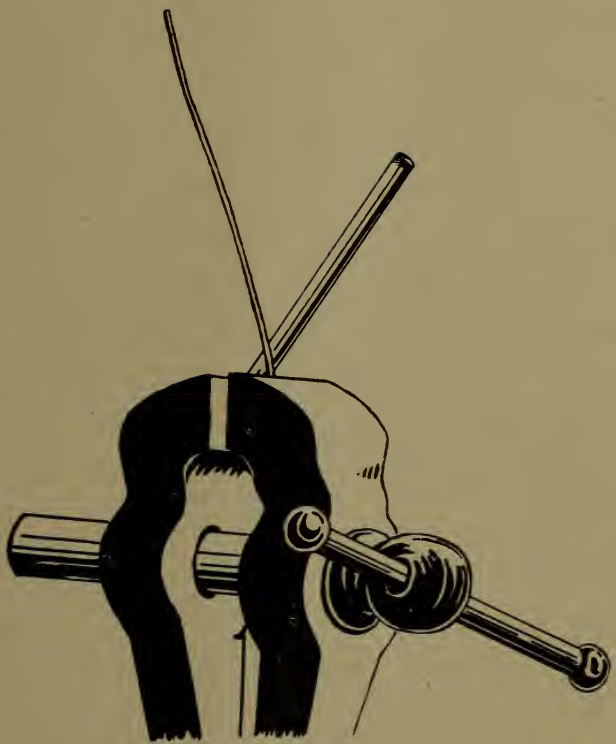
Proper Way to Hold Spring When Tempering.

fill it about full of hog lard. The best lard for this purpose is rendered from meat rinds, as the pelts of animals have a tendency to caseharden steel. Lard two or three years old is much better for this purpose than fresh lard, the older the lard the better. The proper way to temper a spring is to hold it with a small wire while tempering. This

may be done by bending the end of the wire around the end of the spring a couple of times.

Don't try to temper a spring by holding it with blacksmith tongs, as it will break near where the tongs clamp the springs. I recommend blacksmith forge for tempering springs. Use good blacksmith coal or coke. First stir the fire enough to dissolve the lumps of coal before putting the spring in the fire; next place the spring in the fire; have the wire attached to one end of spring; hold the wire with one hand and keep the spring continually moving about in the fire, so the spring will have a uniform heat. The spring must have the same heat all over or it will break. Use a slow draft. Some springs are thicker some places than others, a spring of this kind you should be sure to have the thick part as hot as other parts. When the spring is heated to a red heat, place it in the lard; have the lard handy to the fire, so that it can be placed in the lard the instant it is taken from the fire. When the spring is cool, lift it from the lard, there is always some grease sticking to the spring; put the spring back in the fire. Don't use any draft, let the fire be quiet. Move the spring about till it begins to blaze; lift from the fire, hold in the air till the grease is burnt off, lay the spring on the forge to cool; don't touch it till it is perfectly cool.

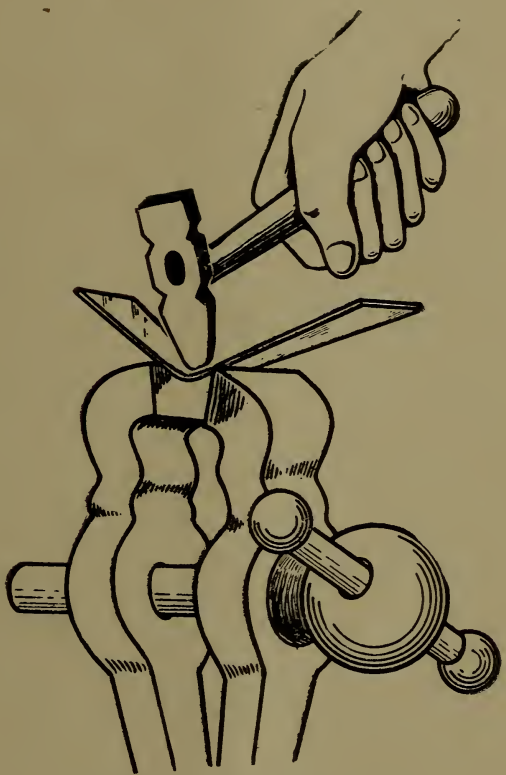
Coil spring should be tempered same way as a flat spring. Any kind of spring steel can be used, saw blades, umbrella



The Way to Make Coil Spring.

wire. Knitting needles are good to make coil springs. They can be purchased from any dry goods store; they are made in different sizes. Steel wire can be purchased from any hardware dealer in any sizes. Fine springs can be made from guitar strings, violin or mandolin strings. This is an easy way to get the material, as the strings are in different sizes; as a rule they do not require tempering.

To make a coil spring use iron bolt or piece of iron rod the size the spring is wanted; place the wire in the vice as shown in cut; wind it around the bolt till it is the desired length. If the spring is to be made out of large wire that is already tempered, the wire should be heated to make the wire pliable and easily bent. After the spring has been wound, remove from the bolt, place in the fire, turn the spring over continually in the fire while heating; when it is to a cherry red, plunge it in the grease; leave in the grease till cool, lift out and burn the grease same as the flat spring mentioned on the other page.



Bending Spring Steel.

Flat springs can be made of tempered steel, if they do not have to be bent to a sharp angle. To make a pistol spring without drawing the temper or reheating may be done in this way: Find a piece of tempered spring steel the size the spring has to be; lay the spring across the vise, open the vise enough to make a little space under the spring, use a very light hammer that has a flat end; tap the spring with the hammer above the open place in the vise. This will cause the spring to bend, continue striking the spring till it is to the right angle. Any kind of tempered spring steel can be bent to almost any angle in this way.

It is always better to use steel the proper thickness than it is to forge down, as the steel is often cracked while forging. Sometimes the steel has to be forged down to get the proper dimensions for the spring. In this case care should be used not to heat the steel too hot or hammer it when too cold.

To make springs where there has to be short crook, like gun springs, bend the spring together and open with a screw driver while hot. By reading these directions closely and a little practice, any one can make springs.

HOW TO TEMPER RAZOR BLADE.

Cut off a piece of sheet iron or tin length of razor blade, and about one inch wide. This makes a shield to put over the edge of razor; each side of shield should be wide enough to reach up to back of the blade. It is a good idea to wrap a small piece of wire once around the blade; this will keep the shield from coming off while heating. Next put the blade in the fire and heat to a cherry red; turn the blade over in the fire a time or two while heating. Drop in the water, take the shield from the blade, and test with a file. If not hard enough, repeat in the safe way. Some blades require more degrees of heat than others, as there is difference in the steel.

When heating any kind of thin edge tool to temper, it should be remembered to turn the tool over different times while heating, as that will prevent the tool from bending when dropped in water.

HOW TO TEMPER CHOPPING AX.

The important thing about tempering ax is to keep the steel from burning; this may be done by using slow draft. Use a blacksmith forge, place the ax in the fire, turn on the draft a few minutes, stop the draft one minute. Continue stopping draft and turning on till the ax is heated red hot up to about where the handle fastens in. Before lifting the ax from the fire, let it lay about one minute after the draft is shut off; next lift from the fire, place the ax in water, with the edge straight down to a depth of about three inches in the water; lift from the water, notice the blue rays; when it gets to a straw color at the edge, drop back in water, let lay till cool.

TO SHARPEN WORN THREAD DIES.

Worn thread dies may be sharpened by drawing the temper, file the trenches little larger than they originally were, this will square the corners of the trenches. The corners of the die are the parts that do most of the cutting. The thread pins, or thread dies, can be sharpened in this way: Dies may be tempered by heating to a cherry red, put cyanide on, drop in cold water. The cyanide will make the surface of the steel much harder that the center parts, this will prevent the die from breaking.

HOW TO SHARPEN SHEARS OR SCISSORS.

There are tricks in all trades, sharpening shears same as everything else. In scissors, in good cutting order, the blades are bent. If you look at any new shears, you notice the blades are bent; they should be bent, otherwise they will not cut. Steel shears sometimes get the blades straight by cutting heavy cloth. Before sharpening shears, you should see that the blades are bent enough so that they seem to want to cross each other a little when closing. Always have the rivet loose enough so the blades will work freely. The best way to get the blades bent is to lay the oval side of the blade on a level piece of iron, hammer the flat side with a light hammer, tap the blade light blows with the hammer till it is bent to the right shape. It is not necessary to take the shears apart to put them in good cutting order. One side of the blade must be perfectly level; if the shears are wore round along the edge, grind them down till the rounding part is all off. Cast shears cannot be bent or straightened, as they will break if struck with hammer. All that can be done to cast shears is to grind them till the rounding edge is off.

HOW TO TEMPER POCKET KNIFE BLADE.

Blade can be tempered by heating it on a piece of steel; use a piece of steel about two inches wide, eight inches long, quarter inch thick; lay the blade on the steel, heat the steel till the blade is to about a white heat, let the blade slide from the steel into cold water. When heating the blade it should be turned over on the steel several times. This is to keep the blade from bending when dropped in water.

Use light tongs to turn the blade over when heating, clamp the end of the blade that has the hole when turning it over.

HOW TO TEMPER A COLD CHISEL.

Use slow draft, heat the chisel till it is red hot 2 inches from the edge, stick the chisel in cold water to the depth of one inch, lift from the water. You will notice a blue appearance on the chisel where it came in contact with the water; hold the chisel out of the water till you notice a straw color about the edge of chisel; when this appears, drop in the water. Great many mistakes are made by not heating the chisel back far enough from the edge. Care should be used while heating the chisel not to burn the steel. It is better to move the chisel about in the fire while heating, this will prevent the steel from burning.

HOW TO CASEHARDEN.

Iron machines of all kinds have some parts casehardened. I put before the public the quickest way known to do case-hardening. Some gun factories use bone dust to case-harden small fire arms, such as guns and pistols. This is done by putting the parts in an oven and covering with bone dust and baking four hours. Pieces of leather put around the parts and baked will have about the same effect as bone dust. The method I refer to is done by heating the iron to about a welding heat, have potassium cyanide handy, place the iron in the cyanide, lift out quickly as possible, plunge in cold water: If the iron is not hard enough repeat in the same way. Another way is to heat the iron to about a welding heat, lift from the fire, put cyanide on, put back in the fire and heat to about a welding heat, drop in cold water.

A QUICK WAY TO MAKE THREAD CUTTING DIES.

Use a nut that already has the threads, caseharden the nut, screw it on the article that is to be threaded, the threads will be the same as in the nut. Threads may be cut in a nut by casehardening a bolt. Before casehardening nut or bolt, it is better to file about three little trenches in the nut. Prepare the bolt the same way, file trenches. This will cause the tools to cut smoother and better. The trenches should be filed about like blacksmith dies. This method will be valuable when cutting odd sized threads or cutting left-hand threads, as it requires only a few minutes to make this kind of tool.

BRAZING.

Brazing is a part of work that every mechanic should be able to do. There are many good mechanics that do not understand the art of brazing. It might be supposed by some people that it would require years of experience to master this art. By the aid of this book and a little practice any one can do all kinds of brazing. The word brazing means in a mechanical way to put two parts of metal together. With brass there are different ways to do this class of work. The method I most refer to is done with a blacksmith forge. Use good coal, such as blacksmiths use. Before putting the parts in the fire that are to be brazed, have the coal well charred. The parts that are to be brazed should be attached together with rivets, or the ends filed to a wedge shape and lapped over about a half inch and wire wound around the parts to hold them together while brazing. After the brazing is done and the work is cool, file the wire from the parts. Another way to fasten parts together while brazing, such as gun hammer or similar things, can be done by drilling a hole in each end of broken parts, put a steel pin in the parts, drive them together so they will fit nicely together before brazing. Before brazing any kind of metal, the parts should be filed to a bright finish, this is to remove the rust and other things that might be sticking to the metal, put the parts that are

to be brazed in the fire, heat to a cherry red, put on borax. When the borax is melted, put the brass on, heat till the brass is melted, lift from the fire, let the work lay on the forge till cool. The rough scales can then be removed with a file.

One Way to Attach Work When Brazing.

To put in a new cog where one has been broken out, file a slot in the place where the one was broken out, fit in a piece of steel the size the cog should be, after it is brazed file down to match the other cogs. If the wheel is cast it requires more attention, as cast is much harder to braze than steel or iron. To braze any kind of cast, cyanide of postassium should be used; make a mixture of one part cyanide, one part borax, equal parts.

To braze cast, the fire must be watched carefully, or the cast will burn. To braze cast, heat same as iron or steel; when the cast is red hot, put on the cyanide and borax,

next put the brass on, heat till the brass begins to melt, put on little more cyanide and borax; move the work about in the fire. While brazing large parts of work, you will notice there is a hollow space burnt out under the parts while heating; this should be watched. When this happens fresh fire should be raked under the parts. This does not happen while brazing light work, as the draft is not kept on long enough to burn out a hollow space.

To braze large tubing it is necessary to use a gasoline brazer or acetylene welding machine. All kinds of solid iron, steel or cast can be easily brazed with a blacksmith forge up to the size of one inch and a quarter in diameter. When brazing heavy parts the draft should be turned on about forty seconds, stop twenty seconds, repeat in this way till the brass is melted. This idea is to keep the brass from burning. If a large piece of iron was heated hot enough to melt the brass without stopping the draft, the brass would be burnt to nothing. One reason in using a slow draft is to get the parts to a unifom heat.

When brazing cast it is necessary to move the work about in the fire a time or two while heating; same thing to weld cast steel, it is always better to move the parts in fire when heating, as this keeps the steel from burning.

Different kinds of brass can be used for brazing purposes. Smelters' brass can be bought from any hardware dealer. Brass clock wheels make good material for brazing.

Copper can be used to braze with, but is not as good as brass, as copper is much softer metal. One thing should always be remembered, before brazing anything, the parts should be well cleaned.

One way to prepare flat parts of iron to braze is done by cutting slots in each part that is to be brazed. This is shown is cut. Slots can be cut with hacksaw or file and the broken parts fitted together with flat pieces of steel before brazing.

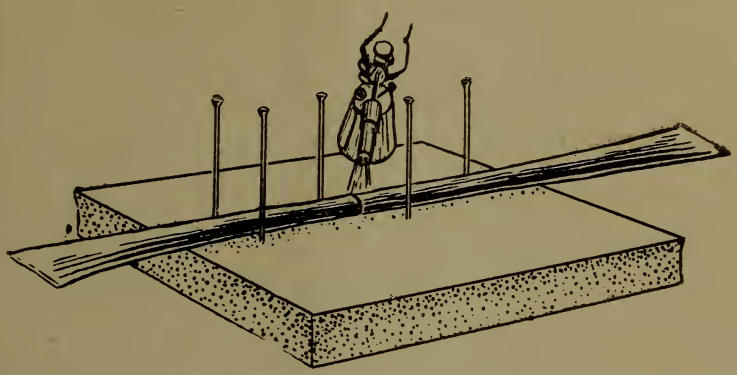
How Flat Iron Is Fastened Together to Braze.

HARD SOLDERING.

Hard soldering is a class of work similar to brazing, only difference, silver is used in place of brass. The first thing I will call your attention to is soldering band saws. The broken ends should be filed to a wedge shape; the ends should be lapped over about half inch; file the ends so they will fit properly. Care should be taken not to get the broken place thicker than other parts of the saw; next thing put thin piece of silver between the ends that are to be soldered; heat a pair of blacksmith tongs to a white heat, sprinkle borax on the parts that are to be soldered.

It might be necessary to put a little borax between the ends. Clamp the tongs on the parts that are to be soldered. Leave the tongs clamped to the saw till cool, the job is then completed. Silver solder may be purchased from any jeweler, but the best and quickest way to get material is to hammer a silver dime to about the thickness of writing paper. One dime will do many light jobs of soldering. Silver watch cases may be used for material; a genuine silver case is stamped inside of case, "Coin silver." Don't try to use any other kind. The kind of tongs that should be used to solder saws should have heavy jaws, about one inch thick, as they will hold heat longer than light tongs. It does not require but a small part of a dime to solder band saw.

Any kind of broken brass or copper can be put together with silver solder and made as solid as before broken. To do this the broken parts do not have to be lapped over as when soldering band saws. To do this kind of work, asbestos soldering block should be used. To make a soldering block, use asbestos paper, which can be purchased from any hardware dealer at a very little cost. Only tools needed are a pair of shears; cut the paper in about four inch squares, cut enough blocks to make about one inch thick, put the blocks together by driving little brads or small nails through the paper; this will hold the block together. Lay the broken article on the block, put the broken



Hard Soldering Block.

ends together, place them so they will join together nicely; next stick little pins in the block; place them against the article that is to be soldered. This will hold the parts together while soldering. Next use a blow torch, turn the blaze on the broken parts till it is hot enough to melt borax, sprinkle borax on, then have a thin piece of silver made from a dime, lay the silver on the broken place, turn on the torch till the silver is melted; let lay till cool. The article will be found solid as before broken.

It is not necessary to use the soldering block only to do light work, such as broken parts of music instruments and other similar things.

To put a new cog in a brass cogwheel, file a slot where the one has been broken out. The new cog can be made of brass or steel, it does not make any difference. The cog

must fit in the slot tight enough to hold it while soldering. Hold the blow torch to the cog till it is hot enough to melt borax; put the borax on; next lay on a piece of silver, hold the torch to the silver till melted. The cog then can be filed to match the others. Any parts of German silver, steel, copper, iron or brass can be soldered with silver.

Any kind of brass tubing used about automobiles can be put together with silver and made perfectly solid. The important thing is to have the broken parts fitted nicely together before soldering. To solder hollow tubing, one inch or more in diameter, it is necessary to make three or more heats where the tube is jointed together. Solder one place, turn the tube about one-third round, solder again, and so on till the solder is melted all around the joint. A double jet torch should be used to do hard soldering, as the double jet makes much stronger heat than a single jet.

Soldering tin and hard soldering are different classes of work. Most repair men are familiar with tin soldering. It is not necessary for me to say much on this subject. The most important thing about tin soldering is mixing the acid. Muriatic acid should be put in a glass vessel. Thin parts of zinc should be put in the acid, this will cause the acid to boil, when the acid is about to quit boiling, remove the parts of zinc from the acid, don't wait till the acid has entirely quit boiling, as it will be too weak.

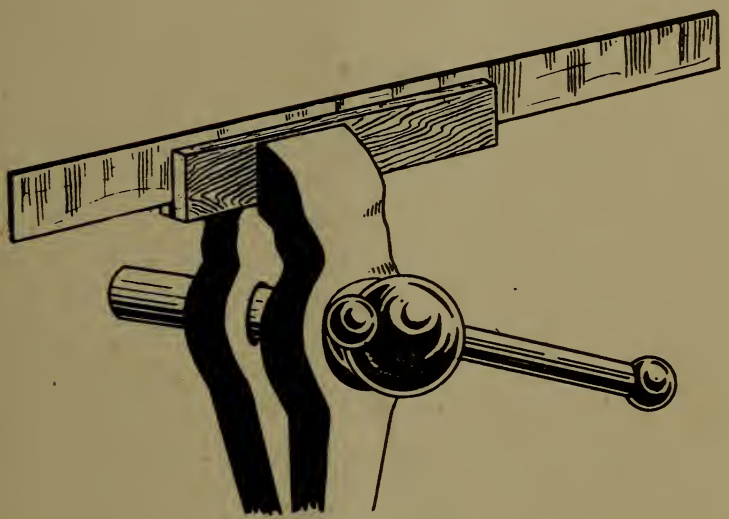
To solder parts of iron together, it is necessary to tin the parts; this may be done by first heating soldering iron, put acid on the parts that are to be soldered, place a piece of tinners' solder on, turn the torch on the solder, move the soldering iron back and forth till it forms a thin coat of solder; each part to be soldered should be treated in the same way. When this is done, put the two parts together, turn the torch on the parts till the solder is melted. Parts to be soldered should be perfectly clean and free from grease and dirt. Another way is to put the two parts together that are to be soldered, put acid on, lay on a piece of solder, hold the torch to the parts till melted. This will unite the two parts together.

To solder tin the soldering iron should be heated and moved about on sal ammoniac, this is to clean the soldering iron; next move it about on the solder till the soldering iron is tinned.

HOW TO MAKE HACK SAW BLADES WITHOUT ANY EXPENSE.

Broken talking machine springs can be gotten from most any music dealer, free of charge. Cut off piece of spring long as desired, next use two blocks of wood one inch thick, two inches wide, about eight inches long.

Put the blocks in the vise, place the spring between the blocks. This way the spring will be held solid while cutting the teeth. Use very light cold chisel to cut the teeth, also light hammer, hold the chisel on the spring; each blow with the hammer will make one notch in the spring; each notch is one tooth. After the blade has been hacked with the chisel, remove from the vise, lay the end of the blade on a nut that has about three-sixteenth inch hole, drive a small punch through the blade. The blade is ready for service. With a little practice anyone can make a blade in ten minutes; the blade can be resharpened by filing the old teeth down till the blade is level along the edge; hack the blade with the chisel as before. One spring will make enough blades to last several years. These blades will not break by sawing through hollow tubing, such such as gas pipe. The important thing about making the blades is to make the teeth close together. Anyone will be surprised to see how these blades will cut and how simple it is to make one.



How to Make Hack Saw Blade.

HOW TO RESHARPEN OLD FILES.

Sprinkle cyanide potassium on a flat piece of iron, heat the file red hot, move the file about in the cyanide till it has a coating, place the file back in the fire, heat to a white heat, drop the file in cold water. The file should be moved about in the fire while heating so as to make a uniform heat.

Another way is to heat the file to a white heat, turn it over once in the cyanide, drop in the water; a file treated this way will cut about like new.

HOW TO SHARPEN A HAND SAW.

Fasten the saw in a vise. Use a piece of wood about one inch thick, abut two inches wide, eight inches long. Hold the piece of wood against the side of saw, hold a flat file on top of saw, and top of wood, move both at the same time back and forth, this will cut the teeth level. The piece of wood that the file rests on should be perfectly level, otherwise the saw will not cut straight through a board. After the teeth are leveled, next thing is to set the saw. The saw should not have too much set, as it will cause the saw to cut slow. After the saw is set, next is to sharpen. The secret about sharpening a saw is the filing part. Always file the teeth so the points will lean toward the little end of the saw. If the teeth should lean toward the handle of the saw, it would not cut fast, the teeth would rather slip over the wood than cut. Always slant the teeth so they will dig in the wood when pushing the saw.

HOW TO ENGRAVE NAME ON STEEL.

Coat the article over with a thin layer of wax. Draw the name in the wax. Make a mixture of six parts of water, one part of sulphuric acid, in a few hours remove and wash with clean water.

HOW TO BROWN STEEL.

Make a mixture of aqua fortis and sweet spirits of niter, each half ounce, sulphate copper two ounces, water 30 ounces, tincture of iron one ounce; mix and apply with a brush.

HOW TO CLEAN JEWELRY.

Jewelry, brass or copper can be cleaned and made bright by dipping in a solution made of water and cyanide. Place a lump of cyanide about the size of a walnut in a glass vessel that contains about a pint or a little more of water. After cleaning the articles, rinse in clean water and dry in sawdust. This is done by shaking the article in the sawdust.

HOW TO PREVENT IRON FROM RUSTING.

Rub the article with a mixture of lime and oil. Iron articles can be kept from rusting by coating them with a varnish made by dissolving one part white wax in 15 parts of benzine. Apply with a brush; the thin layer of wax forms a light covering for the bright tools.

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